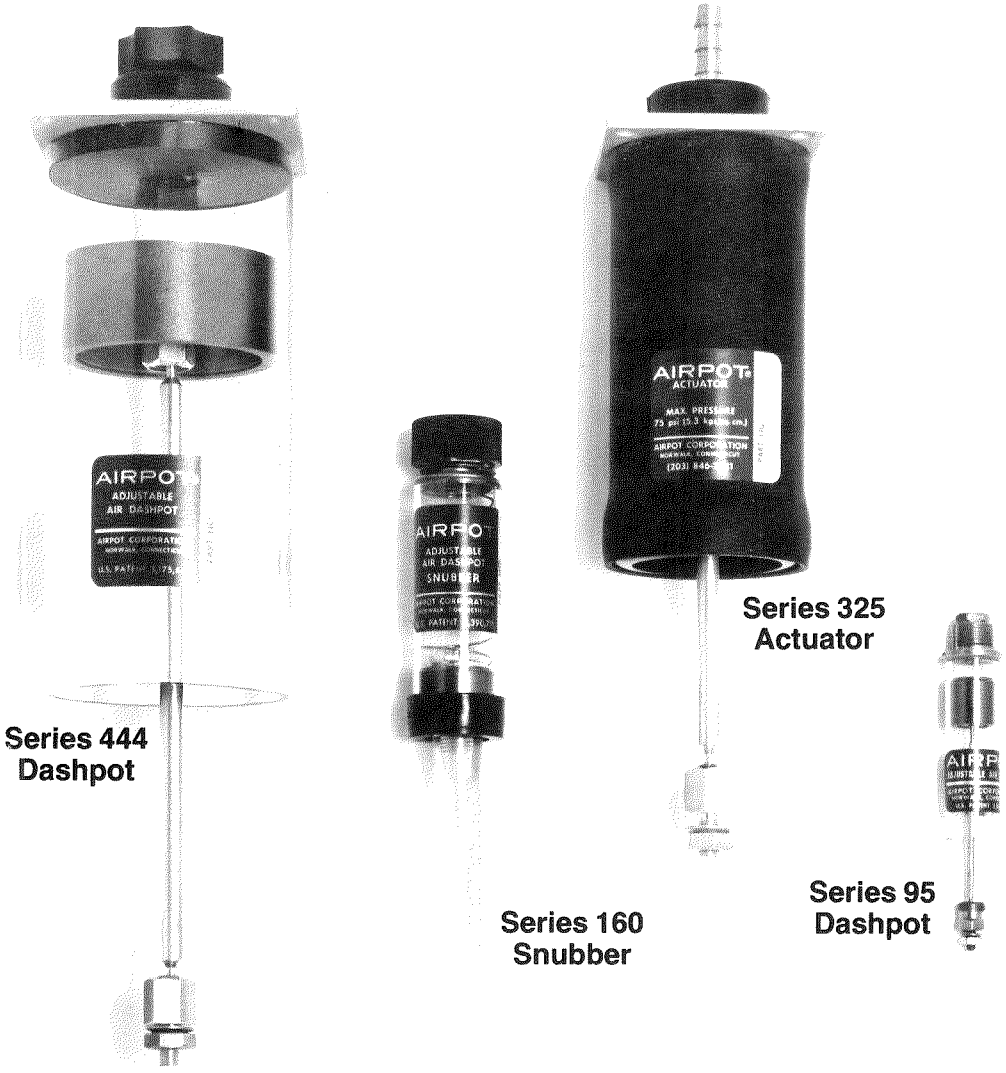

AIRPOT®
ADJUSTABLE AIR DASHPOT
AIRPOT CORPORATION
NORWALK, CONNECTICUT U.S.A.

Airpot®

A brief look at Airpot® . . .



Series 444 Dashpot

Series 325 Actuator

Series 160 Snubber

Series 95 Dashpot

CATALOG CONTENTS

Airpot® gives you better motion control

Four Reasons to Specify Airpot® Dashpots . . .

Prevent damage to sensitive equipment from shock and vibration.

Reduce impact noise.

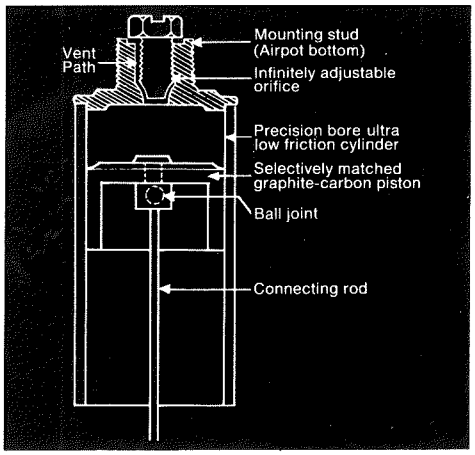
Provide simple, low cost speed control for positioning, sequencing and scanning.

Provide non-electrical control capability for dynamic mechanisms.

The Design

The Airpot dashpot is an unique device that reduces or totally eliminates many of the undesirable side effects of motion in a wide variety of motion control problems. This is accomplished by forcing air through an orifice to dissipate kinetic energy, which is transformed into heat by the molecular friction of compression and vented to the atmosphere.

The Airpot is an exceptional engineering achievement: Simple, long lasting, and functional. It consists of a cylinder, piston, adjustable orifice, and connecting rod. To make that simple design work as well as it does, special materials such as graphitized carbon for the piston and Pyrex* for the cylinder were required. These materials have a high strength-to-weight ratio, excellent stability under extremes of temperature and humidity, and close coefficients of thermal expansion. As a result, Airpot offers the following features:



How It Works

The force to be damped is transmitted through the Airpot piston rod, which moves the piston within the cylinder. Ambient air is the damping medium.

The rate of air transfer is determined by the diametric clearance between the piston and cylinder, and by the orifice setting. As the piston moves in response to the force exerted, there will be a change in volume and pressure in the Airpot, causing ambient air to enter or leave the cylinder. By a simple adjustment of the orifice, the rate of airflow is controlled to provide the exact degree of damping required.

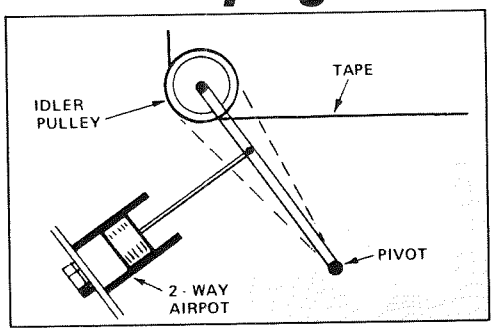
*Pyrex® is a registered trademark of Corning Glass Works.

The Features

- ☐ Precise and accurate.
- ☐ No liquids to leak and no seals to add friction.
- ☐ Self-lubricating.
- ☐ Will not rust, corrode, or deteriorate.
- ☐ Life span of multi-millions of cycles. Will probably outlast any machine on which it is used.
- ☐ Easily adjustable over a 10,000: 1 damping range. Allows fine adjustment at installation.
- ☐ Unaffected by temperature variations and severe environmental conditions.
- ☐ Can be cycled rapidly without overheating.
- ☐ Can be mounted to operate in any position.
- ☐ Damps bidirectionally or unidirectionally.
- ☐ Compact for limited space and locked-in designs.
- ☐ Low start friction and almost identical running friction prevent bouncy or sudden starts.
- ☐ Requires no electric power, eliminating concern about line spikes, power surges, and power failures.
- ☐ Easily modified to meet most special requirements through the selection of options at little extra cost.

Typical Applications

Vibration Damping



Dashpot damping is one of the simplest ways of eliminating vibration. The Airpot dashpot excels in providing a high ratio of damping to friction force.

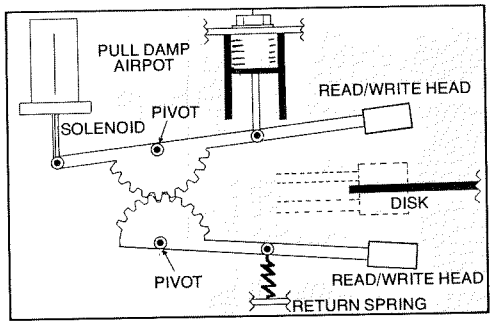
In magnetic tape recorders (as shown above) a two-way damping Airpot significantly reduces idler arm vibration caused by reel stiction or sprocket pulsation. The idler can still move freely to accommodate changes in the loop profile. Using an Airpot improves the sound fidelity, the sound track synchronization and the film or tape response during the start-up acceleration.

In high speed fiber optic filament, wire, and textile winders where oscillation of tension idlers can cause broken filaments.

In photographic and precision optical equipment where vibration of lenses, mirrors, filters and shutters can lead to damage or blurred images.

In sensitive recording pens and indicator needles to prevent incorrect readings as a result of ambient vibration.

Velocity Control *(solenoid)*



It is often desirable to slow a solenoid down to avoid a crash or high impact on closure. The Airpot tunes the solenoid to obtain the fastest motion possible without noisy impact or damage to components.

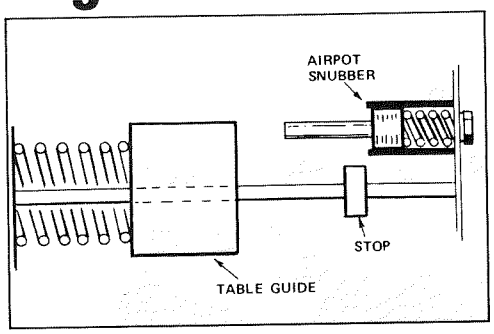
In computer floppy disc drives (as shown above) a pull damping Airpot controls a solenoid which positions the read/write heads. The Airpot significantly increases head and disc life by reducing head loading impact.

In automatic diagnostic equipment to control the travel of dispensers and positioners as samples move from one station to another.

In silicon wafer transport mechanisms to prevent bounce and overshoot as solenoids lift wafers into position.

In computer data card sorters and stackers to eliminate noise caused by solenoid actuated sorting gates.

Snubbing



When controlled deceleration is required only at the end of the stroke of your mechanism, the Airpot snubber configuration is particularly useful. It performs push damping only and the push rod is not connected to the work.

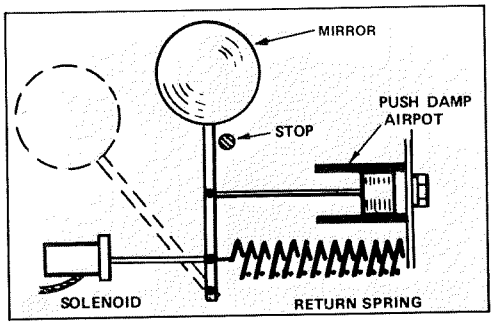
In office copiers (as shown above) an Airpot snubber damps the lens carriage at the end of its return stroke. Because of this controlled deceleration, impact noise and bounce are prevented, permitting faster machine operation. The return spring in the Airpot snubber quickly resets the piston for the next cycle.

In cash register drawers and instrument doors to prevent injury to personnel.

In computer peripherals, duplicating machines, storage cabinets to snub moving platens and access doors.

In automatic photographic equipment to ensure smooth movement of sliding mechanisms.

Velocity Control *(spring)*



Springs provide motive force to a mass at the expense of continuously increasing velocity. Airpot damping develops an opposing force to limit this velocity to a desired value.

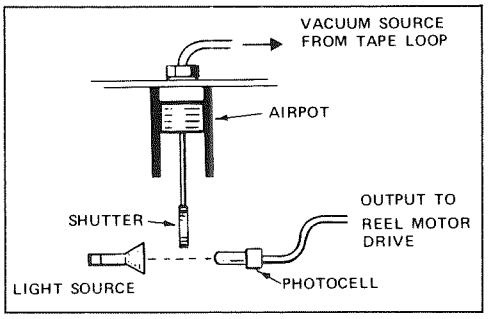
In automatic slide projectors (as shown above) a push damp Airpot controls a mirror as it swings into position. The Airpot damping increases as the element approaches a stop, allowing rapid positive positioning without loud noise or impact damage.

In office copiers, card readers, microfilm scanners and automatic photo processing equipment to control the scan rate and positioning of lenses and filters.

In card sorters, automatic mailing and addressing equipment and automatic check writers to regulate the positioning mechanisms.

In spring loaded doors, x-y slides, tape cartridge carriers to prevent damage on release.

Actuation



Pneumatic actuation is the use of air pressure or vacuum to supply motive force. The Airpot is capable of responding to small pressure changes in proportion to process variations.

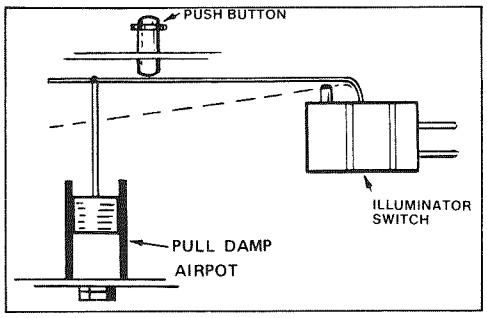
In computer tape drives (as shown above) an Airpot assures that an acceptable tape loop profile is maintained continuously. When coupled to the computer vacuum tape loop system through a hose fitting, the Airpot responds to pressure changes caused by variations in the profile. The piston motion changes the signal to the reel drive motor, causing it to increase or decrease speed.

In automatic assembly and semi-conductor equipment to dispense or position parts.

In controlled processes such as blending, mixing, filling, emptying, leveling to give a magnified indication of minute pressure changes recorded by pens or indicator needles.

In medical equipment and dispensing devices to pump precisely measured quantities of samples and reagents.

Time Delay



Airpot offers reliable timing control for non electrical systems and for electrical systems requiring non electrical backup.

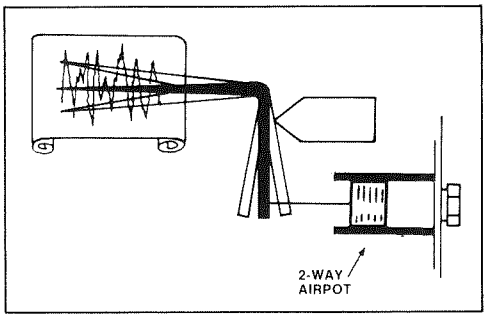
In an x-ray machine illuminator (as shown above) a pull damping Airpot precisely regulates the arm's return of the push button switch. Since timing is a function of force, stroke and damping capability, the switching time can be changed simply by an adjustment of the Airpot orifice.

In cameras to sequentially time releases of shutters and feed mechanisms.

In time delay relays to give contacts instant relay transfer on energization and delayed transfer on de-energization or vice-versa.

In air conditioners, alarms, elevator doors to delay re-start.

Limiting Overaction



Many instruments are susceptible to random pulses or surges leading to harmful over-range conditions. Velocity sensitive, the Airpot resists these surges to provide more consistent operating conditions and prevent damage.

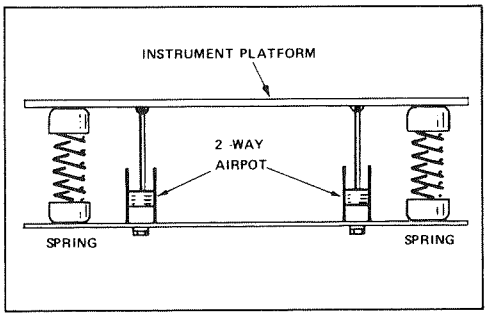
In sensitive temperature recorders (as shown above) a two-way damping Airpot prevents the recording pen (used to track the trend of milk temperature readings) from reacting violently to sudden changes. The Airpot is an inexpensive, compact device to stabilize the pen during transient temperature extremes.

In pressure transmitters when pulsing and surging cause damage to critical sensors.

In heating and air conditioning systems to prevent hunting of air vanes resulting from airflow surges.

In professional tape recording equipment, dubbers, motion picture projectors, film duplicators where high speed stop and start can lead to overshoot, fouling and backlash.

Shock Absorption



Vibration and overaction often combine to cause shock conditions similar to those associated with vehicular motion. Airpot damping is specifically oriented toward shock loads normally encountered by low mass systems under such conditions.

In a mobile testing lab (as shown above) two large diameter 2-way Airpots dissipate stored energy of the springs used to control shock. This avoids the risk of instrument damage caused by bouncing and jarring of the vehicle.

In sensitive scales to protect them from loading shock without interfering with measurement.

In cam loaders to eliminate slam and bounce during off-cam travel.

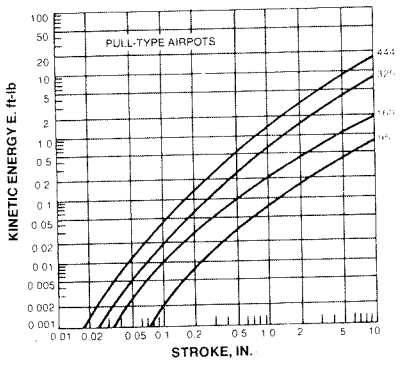
In stepper motor driven mechanisms to prevent jarring caused by actuation impulse.

Airpot® Engineering Data

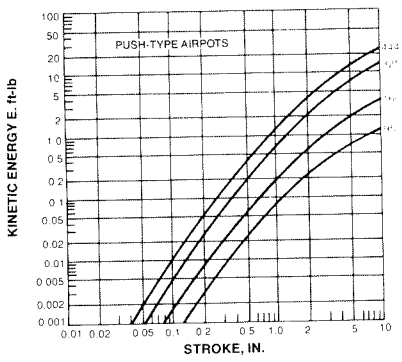
While the Airpot Dashpot is an extremely simple mechanical device, some basic engineering information will be useful in determining whether an Airpot is right for a specific application and which of the many configurations might best suit these requirements. The following graphs and tables will help in Airpot selection.

Airpot size and stroke for snubbing and shock absorption applications

GRAPH 1



GRAPH 2



To select an Airpot, find out how much kinetic energy needs to be absorbed. The total kinetic energy of the moving parts of the mechanism being stopped can be computed with standard equations.

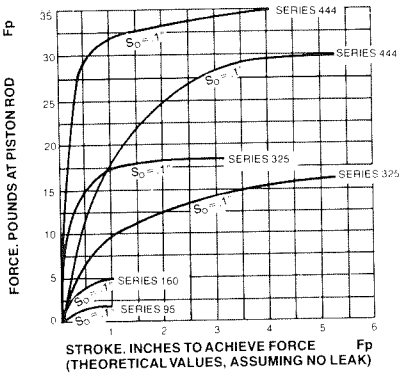
Every moving body has kinetic energy proportional to the product of its mass and the square of its velocity. The general equation for linear kinetic energy is $E = MV^2/2$, where E is kinetic energy, ft-lb, M is mass, slugs (lb/32.2), and V is velocity, ft/sec. For rotating bodies, the equation is $E = MK^2N^2/183$, where K is radius of gyration, ft, and N is angular velocity, rpm. The two energies can be added.

Part of the kinetic energy gets absorbed in the mechanism itself. Estimate it, subtract it from the total kinetic energy, and specify a smaller Airpot to absorb the rest. If it cannot be estimated, use the total kinetic energy to select the Airpot; the size will be conservative.

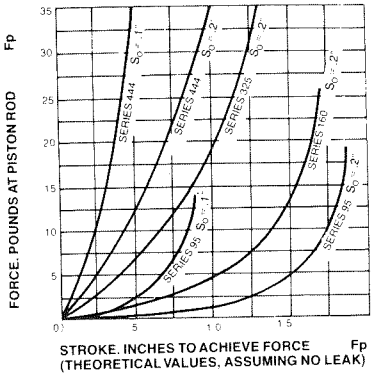
The velocity of the impact is not as important to know as the total kinetic energy. The same Airpot can handle heavy weights at low velocity and light weights at high velocity, as long as the kinetic energy is the same.

Relationship between stroke, force rise and starting position.

GRAPH 3 AIR SPRING EFFECT—PULL DAMP AIRPOT



GRAPH 4 AIR SPRING EFFECT—PUSH DAMP AIRPOT



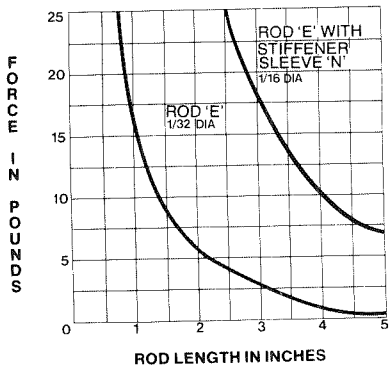
S_o definition: Distance between piston face and cylinder bcttom at start of stroke.

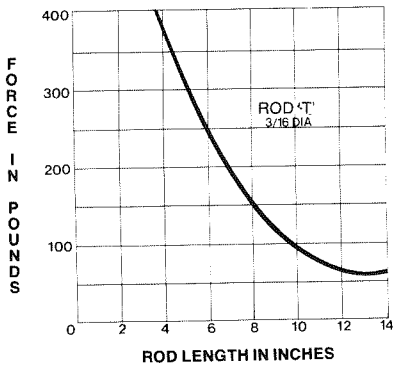
Measurement Conversions: From pounds to kilograms, multiply by .454.

From inches to centimeters, multiply by 2.54.

From foot pounds to kilogram centimeters, multiply by 13.85.

Rod Buckling Curves





Damping Required

Approximate damping required for timing and velocity control can be determined by using this formula.

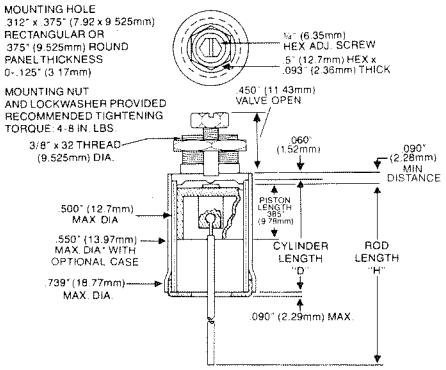
$$\text{Damping} = \frac{FT}{D}$$

Where F is force in pounds. T is time in seconds and D is stroke in inches. Final units are expressed in pounds per inch per second.

Airpot® Dashpot Dimensions

The following drawings represent both OEM and stock Airpot Dashpots. The differences between the two product lines are that the OEM line offers greater flexibility with respect to rod styles and lengths, cylinder lengths, and additional options. Also, note that the adjustment knob, cylinder covering, and piston retainer are standard on stock units but optional on OEM models.

DASHPOT SERIES 95



Bore:
.366" (9.3mm)

Damping Coefficient
Regular damping: 1 # /in./ sec.
Super damping: 2.5 # /in./ sec.

Maximum Pull Force:
1.4 # (.6kg.)

Maximum Friction Force:
Less than 1gm.

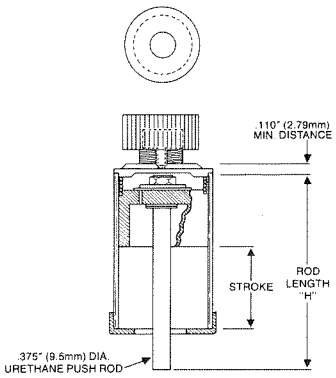
Operating Temperature Range:
−75°C to +150°C

Approximate Piston Weight:
1.5gm.

Cylinder Weight: 1st inch: 7gm.
Each additional inch: 1.7gm.

SERIES 160S (AIRPOT SNUBBER)

(See dashpot series 160 at right for external dimensions)

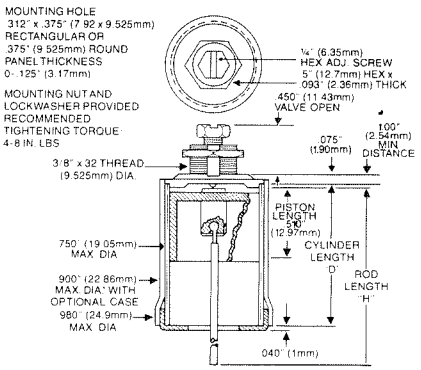


Stroke
Stock Units:
1.25" (31.75mm)
OEM Units:
1.25" (31.75mm) standard.
Other strokes available on request.

Extended Length:
4.075" (103.5mm)

Spring Force
Extended:
.16# (75gm)
Compressed:
.28# (130gm)

DASHPOT SERIES 160



Bore:
.627" (16.0mm)

Damping Coefficient:
Regular damping: 2.5#/ in./sec.
Super damping: 10#/in./ sec.

Maximum Pull Force:
4# (1.8kg.)

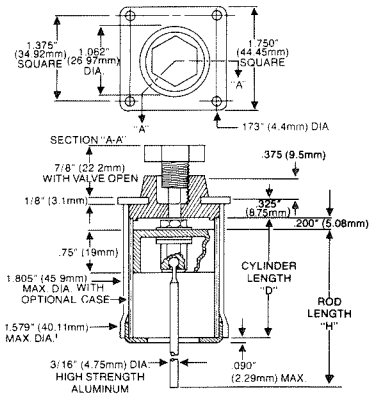
Maximum Friction Force:
Less than 1gm.

Operating Temperature Range:
−75°C to +150°C

Approximate Piston Weight:
3gm.

Cylinder Weight: 1st inch: 8gm.
Each additional inch: 3.6gm.

DASHPOT SERIES 325



Bore:
1.281" (32.5mm)

Damping Coefficient:
Regular damping: 20#/in./ sec.
Super damping: 40#/in./ sec.

Maximum Pull Force:
17# (7.7kg.)

Maximum Friction Force:
Less than 4gm.

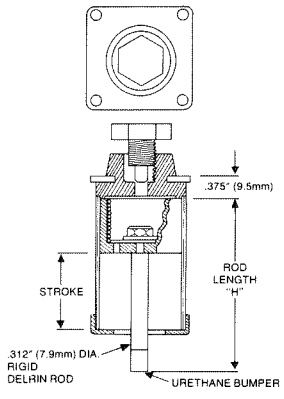
Operating Temperature Range:
−75°C to +100°C

Approximate Piston Weight:
20gm.

Cylinder Weight: 1st inch: 40gm.
Each additional inch: 13gm.

SERIES 325S AND 444S AIRPOT SNUBBERS

(See dashpot series 325 and 444 for external dimensions)

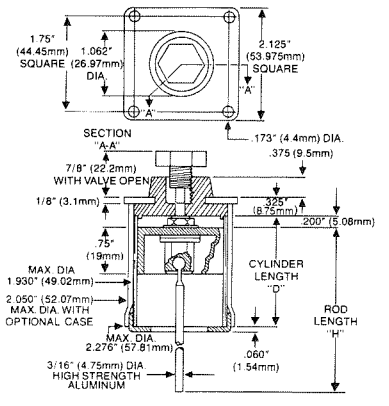


Stroke
Stock Units:
2.25" (57.15mm)
OEM Units:
2.25" standard.
Other strokes available on request.

Extended Length:
5.75" (146mm)

Spring Force
Extended:
.25# (113gm)
Compressed:
.5# (227gm)

DASHPOT SERIES 444



Bore:
1.75" (44.4mm)

Damping Coefficient:
Regular damping: 20#/in./ sec.
Super damping: 40#/in./ sec.

Maximum Pull Force:
30# (13.6kg.)

Maximum Friction Force:
Less than 8gm.

Operating Temperature Range:
−75°C to +100°C

Approximate Piston Weight:
40gm.

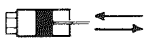
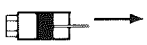
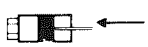
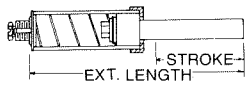
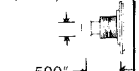
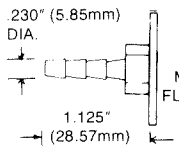
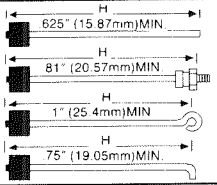
Cylinder Weight: 1st inch: 50gm.
Each additional inch: 18gm.

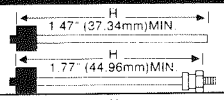
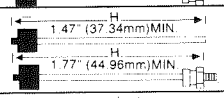
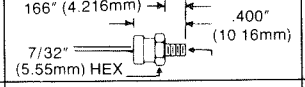
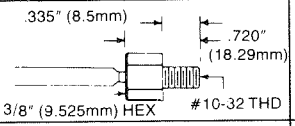
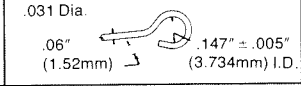
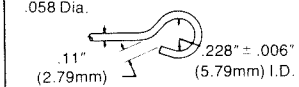
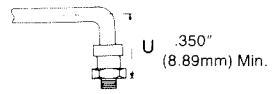
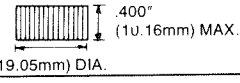
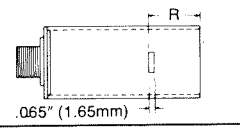
*(Cases, knobs, and piston retainers optional for OEM units: standard on stock units)

Airpot® OEM Models And Options

In OEM quantities, units are scheduled for production after customer selection of the best design for the application. Please refer to the following listings, or contact the Airpot technical staff for assistance in selecting the most useful and cost-effective configuration at extremely attractive OEM quantity discounts.

For low volume applications, refer to stock dashpots on page 9 and stock actuators on page 13.

Option Code	Option	Description	SERIES 95	160	325	444
A	Two-way damping		*	*	*	*
B	Pull damping (Free return)		*	*	*	*
C	Push damping (Free return)		*	*	*	*
S	Snubber Configuration (Push damping only) Spring Return		NA	*	*	*
P	Actuator Configuration Air Hose Fitting P1—.2" dia. hose fitting P2—.080" dia. hose fitting P3—.230" dia. hose fitting Note: All Airpots using hose fittings are supplied with a shock resistant case at no additional charge	P-1 .200" (5mm) DIA. 500" (12.7mm)  P-2 .080" (2mm) DIA. .500" (12.7mm) 	*	*	NA	NA
		P-3 .230" (5.85mm) DIA. MTG. FLANGE 1.125" (28.57mm) 	NA	NA	*	*
D	Cylinder Length	Any length required from .5" to 12". Specify to .XXX (Tol. ±.030")	*	*	*	*
E	Piston Rod See rod buckling strength curves, pg. 7.	.031" (.79mm) Diameter, Spring Temper Phosphor Bronze	*	*	NA	NA
N	Stiffener Sleeve for Piston Rod E Only	.058" (1.47mm) O.D., .033-.036" (.876mm) I.D. Stainless	*	*	NA	NA
T	Note: On Series 160 2-way and push damping dashpots. Rod T Piston assemblies occupy an additional .200" (5.08mm) of cylinder length.	3/16" (4.75mm) Diameter Aluminum	NA	*	*	*
H	Rod Length Any length required. Measured from piston face to references indicated: Specify to .XXX (Tol. ±.030") For Rod E		* * * *	* * * *	NA	NA

Option Code	Option	Description	SERIES 95	160	325	444
	For Rod T Series 325 & 444		NA	*	*	*
H	For Rod T Series 160 2-way and push damp dashpots			*	*	*
F	⅛" Ball Joint (only available with options E or E and N)		*	*	NA	NA
X	¼" Ball Joint (only available with option T)		NA	*	*	*
G	Loop (only available with option E or E and N)		*	*	NA	NA
Y	Loop (only available with option N) Available with optional .156" (4mm) I.D. self lubricating bushing or .208" (5.28 mm) I.D. brass eyelet.		*	*	NA	NA
U	90° Bend Not available with rod T. Consult factory for available lengths.		*	*	NA	NA
K	Shock Resistant Case. (Standard on Actuators)	Resilient 1/16" (1.57mm) Wall Buna-N	*	*	*	*
L	Super Damping	Higher force-time product per unit stroke. (See specifications under outline drawings of each model).	*	*	*	*
M	Adjustment Knob		*	*	NA	NA
R	Port Specify to .XXX (Tol. ±.030")		*	*	*	*

Note: Asterisks (*) fndicate options available for that model.

How To Order OEM Dashpots And Actuators

Develop the appropriate part description utilizing the codes shown in the table above for each desired option. Use the following example for reference:

Series	A,B,C,S,P	Cylinder Length	Rod Type	Rod Length	Rod End	Other	
160	A	D	2.00	E	2.5	F	L

= Parts Description ** 160AD2.00E2.50FL

**Airpot will assign a permanent reference number when order is entered.

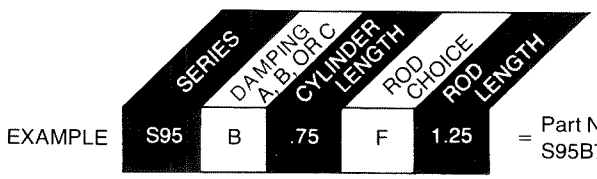
Airpot® Stock Dashpots

Airpot Dashpot designs and applications are covered in detail in this catalog on pages 3-7. For orders of less than 25 units, stock dashpots are available off-the-shelf for immediate and economical use. For larger quantities, on the other hand, selections may be made from the OEM option list on page 8.

SERIES	DAMPING DIRECTION			CYLINDER LENGTH D	RODS AVAILABLE (CHOOSE ONE)	ROD LENGTH H	DAMPING RANGE	MAX. FULL FORCE	FRICTION
	2-WAY A	PULL B	PUSH C						
S95	✓	✓	✓	.75 in.	F or Y	1.25 in.	0-2.5 lbs/in/sec	1.4 lbs	< 1 gm
	✓	✓	✓	1.00 in.	F or Y	1.50 in.	same	1.4 lbs	< 1 gm
	✓	✓	✓	1.50 in.	F or Y	2.00 in.	same	1.4 lbs	< 1 gm
	✓	✓	✓	2.00 in.	F or Y	2.50 in.	same	1.4 lbs	< 1 gm
	✓	✓	✓	3.00 in.	F or Y	3.50 in.	same	1.4 lbs	< 1 gm
S160	✓	✓	✓	.75 in.	F or Y	1.50 in.	0-10 lbs/in/sec	4 lbs	<2 gms
	✓	✓	✓	1.00 in.	F or Y	1.75 in.	same	4 lbs	<2 gms
	✓	✓	✓	1.50 in.	F, Y or X	2.25 in.	same	4 lbs	<2 gms
	✓	✓	✓	2.00 in.	F, Y or X	2.75 in.	same	4 lbs	<2 gms
	✓	✓	✓	3.00 in.	F, Y or X	3.75 in.	same	4 lbs	<2 gms
	✓	✓	✓	4.00 in.	F, Y or X	4.75 in.	same	4 lbs	<2 gms
S160S	NA	NA	✓	2.00 in.	.375" Dia. Urethane	2.67 in.	0-.3ft-lb	NA	<2 gms
S325	✓	✓	✓	1.40 in.	X	2.75 in.	0-40 lbs/in/sec	17 lbs	<4 gms
	✓	✓	✓	2.15 in.	X	3.50 in.	same	17 lbs	<4 gms
	✓	✓	✓	3.15 in.	X	4.50 in.	same	17 lbs	<4 gms
	✓	✓	✓	4.15 in.	X	5.50 in.	same	17 lbs	<4 gms
S325S	NA	NA	✓	3.15 in.	.312" Dia. Acetal	3.10 in.	0-3ft-lbs	NA	<4 gms
S444	✓	✓	✓	1.40 in.	X	3.25 in.	0-40 lbs/in/sec	30 lbs	<8 gms
	✓	✓	✓	2.15 in.	X	4.00 in.	same	30 lbs	<8 gms
	✓	✓	✓	3.15 in.	X	5.00 in.	same	30 lbs	<8 gms
	✓	✓	✓	4.15 in.	X	6.00 in.	same	30 lbs	<8 gms
S444S	NA	NA	✓	3.15 in.	.312" Dia. Acetal	3.10 in.	0-7ft-lbs	NA	<8 gms

How To Order Stock Dashpots

To order stock dashpots, develop the appropriate dashpot part number utilizing the data in the table above. Use the following example for reference:



Airpot® Actuators

The Design

The Airpot Actuator is a precise pneumatic device using air pressure to supply motive force. It excels in the low to moderate force ranges where conventional actuators are typically problematic. Operating without lubrication or seals, it is ideal for systems that cannot tolerate friction or contamination, and it provides a highly reliable and responsive means of performing such functions as positioning, dispensing, deposition, vacuum sensing, mixing, and pumping.

The basic working elements in the Airpot Actuator include an ultra-low friction cylinder, self-aligning—equally low friction piston, and a connecting rod. As air or vacuum is applied, the piston is driven and the work piece attached to the rod is activated. Close matching of the piston to the cylinder bore makes the use of piston seals unnecessary. To allow completely free piston movement, there are also no rod seals. Although this prevents bi-directional pressurization, the return stroke can be actuated by vacuum, springs, or gravity.

Design Flexibility

The OEM user can specify any desired cylinder and rod lengths that fall within our manufacturing capabilities. There are also a variety of hose fittings, connecting rods, and rod ends available. These options are included in the OEM list on page 6.

Special Materials

The combination of a graphitized carbon piston and Pyrex cylinde is critical to the unique operation of the Airpot Actuator. These materials offer . . .

- *exceptionally low and almost identical breakaway and running friction.*
- *close coefficients of expansion and excellent stability under extremes of temperature and humidity.*
- *self-lubrication.*
- *freedom from rust, corrosion, and deterioration with age.*
- *virtually wear-free operation.*
- *high strength-to-weight ratio.*

Applications

The special properties of the Airpot are particularly important in designs that demand high reliability, responsiveness, clean operation, and minimum maintenance. The following are typical applications that benefit from Airpot Actuator advantages . . .

Differences Between Pneumatic Actuators

Typical Pneumatic Actuator Operating Problems

1. **SEAL FRICTION.** Most pneumatic actuators use tight, interference fit seals to minimize or avoid leakage. However, seals invariably create drag and can set during periods of inactivation. In either case, actuator responsiveness is reduced. In addition, low pressure systems may have to overcome friction with a force greater than required to move the load. Under these conditions, achieving smooth start-up may be impossible.

2. **LUBRICATION.** To reduce seal friction and wear, most pneumatic actuators require some type of additional lubrication. However, leaky lubrication represents a maintenance problem and may lead to increased seal wear.

3. **CONTAMINATION.** As seals wear, they shed abraded particles, resulting in contamination of the surrounding environment. The combination of a leaky lubricant and abraded seal material often results in a gummy residue which can clog valves and exhaust into the air.

4. **WEAR.** Worn out seals will require costly actuator repair or replacement. Machine down-time and labor costs for repairs will probably exceed the cost of the entire actuator.

5. **OVERSIZING.** A larger than necessary cylinder may be required to overcome seal friction at the desired operating pressure. Using a large cylinder wastes space and adds to cost.

Computer Peripherals

In computer tape drives for sensing vacuum pressure changes caused by variations in the tape loop profile.

Medical Equipment

In blood analyzers for moving samples between stations and without jerky motion that could cause spillage and inaccurate positioning.

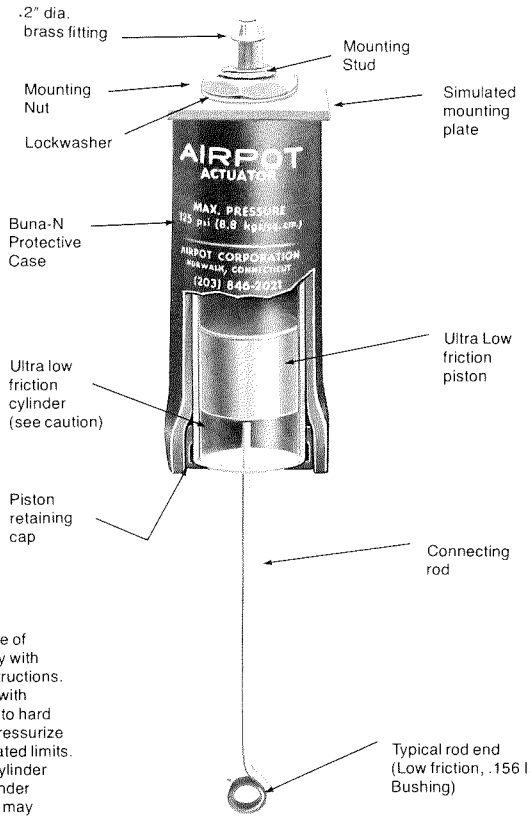
In analyzers for pumping, dispensing and mixing samples and reagents.

Semi-Conductor Processing Equipment

In electronic component placement systems as vacuum probes to pick up, position, and deposit semi-conductors onto a substrate.

In silicon wafer transport mechanisms to position wafers for circuit pattern transfer.

In automated wire bonders for positioning soldering heads.



CAUTION—
Cylinder made of glass. Comply with mounting instructions. Do not strike with tools, drop onto hard surfaces or pressurize beyond indicated limits. A damaged cylinder can shatter under pressure and may cause bodily injury.

Airpot Actuator Advantages

1 **NO SEALS.** Airpot Actuators use a precision fit between piston and cylinder to minimize air leak without jeopardizing responsiveness. The graphite piston and Pyrex cylinder have a 0.2 friction coefficient. Low friction ball joints allow the piston to self-align on the rod and float on ambient air. This results in breakaway and running friction that are not only low but almost identical, virtually eliminating start-up jerk.

2 **NO LUBRICATION.** Since there is very little contact between the piston and cylinder while the piston floats on the air film, smooth operation is assured by the natural lubrication inherent in the piston material.

3 **CLEAN OPERATION.** Without seals, lubricants, or excess friction, the Airpot Actuator has an extremely low potential for contaminating the environment.

4 **LONG LIFE.** Airpot life exceeds 100 million cycles. The piston and cylinder are essentially wear-free except under the most extreme conditions of side loading and general abuse. Properly applied, the Airpot rarely requires replacement and should easily last the life of the equipment in which it is used.

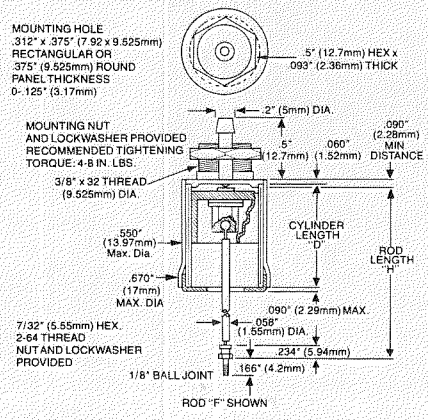
5 **EFFICIENT SIZING.** Since Airpot Actuators are exceptionally responsive at low pressures, there is no need to pay for more cylinder than is required for the application. Airpot Actuators are also lightweight and have a relatively small amount of piston mass to move.

Airpot® Actuator Dimensions *(OEM and Stock Configurations)*

The following photographs and drawings represent both OEM and stock Airpot Actuators. The differences between the two product lines are that the OEM line offers greater flexibility with respect to rod styles and lengths, cylinder lengths and hose fittings. These and other options available to OEM users are shown on page 8.

For applications requiring less than 25 units, choices should be made from the stock selection on page 13.

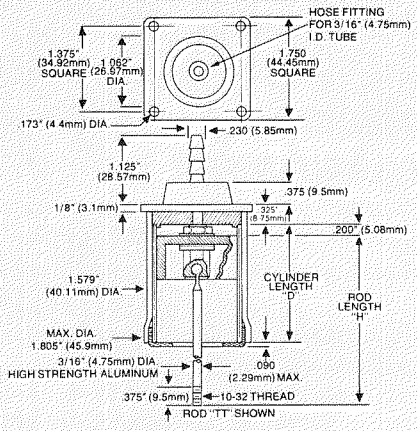
ACTUATOR SERIES 95P



Bore:
.366" (9.3mm)
Maximum Pressure:
150 psi (10 kg/cm²)
Maximum Pull Force:
1.4# (.6kg.)
Maximum Friction Force:
Less than 1gm.

Operating Temperature Range:
–75°C to +150°C
Air Loss:
Regular .01 in.³/sec./PSI
Super .004 in.³/sec./PSI
Approximate Piston Weight: 1.5gm.
Cylinder Weight: 1st inch: 7gm.
Each additional inch: 1.7gm.

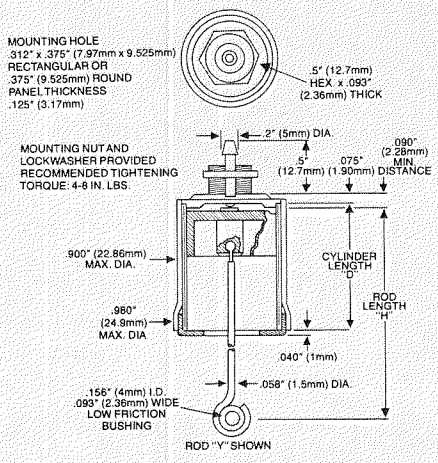
ACTUATOR SERIES 325P



Bore:
1.281" (32.5mm)
Maximum Pressure:
100 psi (7.0kg/cm²)
Maximum Pull Force:
17# (7.7kg.)
Maximum Friction Force:
Less than 4gm.

Operating Temperature Range:
–75°C to +100°C
Air Loss:
Regular: .08 in.³/sec./PSI
Super: .04 in.³/sec./PSI
Approximate Piston Weight: 20gm.
Cylinder Weight: 1st inch: 40gm.
Each additional inch: 13gm.

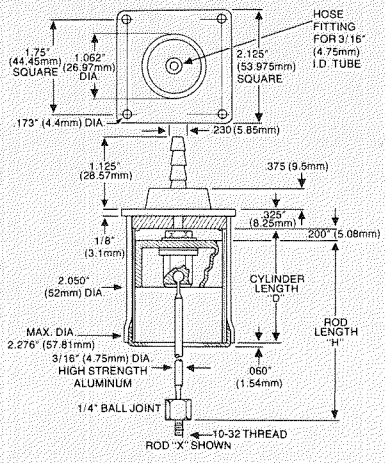
ACTUATOR SERIES 160P



Bore:
.627" (16.0mm)
Maximum Pressure:
125 psi (8.8kg/cm²)
Maximum Pull Force:
4# (1.8kg.)
Maximum Friction Force:
Less than 1gm.

Operating Temperature Range:
–75°C to +150°C
Air Loss:
Regular .04 in.³/sec./PSI
Super .01 in.³/sec./PSI
Approximate Piston Weight: 3gm.
Cylinder Weight: 1st inch: 8gm.
Each additional inch: 3.6gm.

ACTUATOR SERIES 444P



Bore:
1.75" (44.4mm)
Maximum Pressure:
75 psi (5.3kg/cm²)
Maximum Pull Force:
30# (13.6kg.)
Maximum Friction Force:
Less than 8gm.

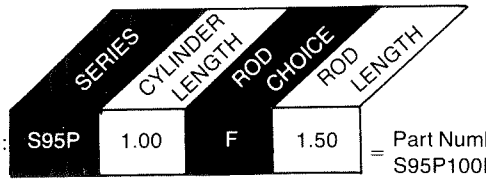
Operating Temperature Range:
–75°C to +100°C
Air Loss:
Regular: .30 in.³/sec./PSI
Super: .15 in.³/sec./PSI
Approximate Piston Weight: 40gm.
Cylinder Weight: 1st inch: 50gm.
Each additional inch: 18gm.

Airpot® Stock Actuator Selection

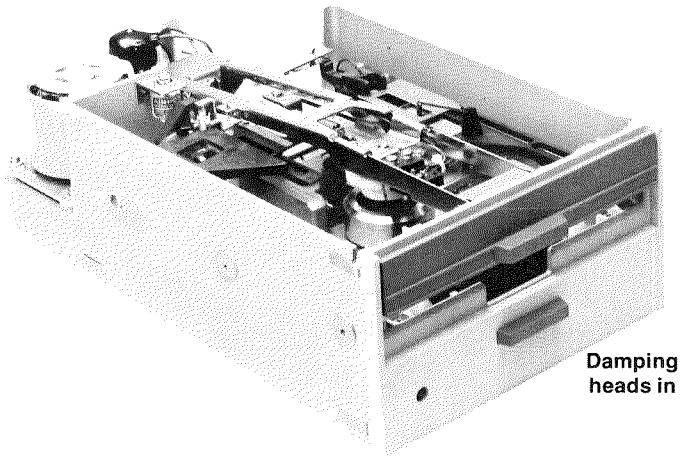
SERIES	BORE	STROKE	CYLINDER LENGTH D	RODS (choose one)	ROD LENGTH H	MAX. PRESSURE	AIR LEAK	FRICTION
S95P	9.5mm (.375")	.50 in.	1.00 in.	F or Y	1.50 in.	150 psi 10 Kg/cm²	.004 cu in/sec/psi	<1 gm
		1.00 in.	1.50 in.	F or Y	2.00 in.	same	same	<1 gm
		1.50 in.	2.00 in.	F or Y	2.50 in.	same	same	<1 gm
		2.00 in.	2.50 in.	F or Y	3.00 in.	same	same	<1 gm
		3.00 in.	3.50 in.	F or Y	4.00 in.	same	same	<1 gm
		4.00 in.	4.50 in.	F	5.00 in.	same	same	<1 gm
S160P	16.0mm (.627")	.50 in.	1.05 in.	F, Y, TTor X	2.00 in.	125 psi 8.8 Kg/cm²	.01 cu in/sec/psi	<1 gm
		1.00 in.	1.55 in.	TTor X	2.50 in.	same	same	<1 gm
		1.50 in.	2.05 in.	TTor X	3.00 in.	same	same	<1 gm
		2.00 in.	2.55 in.	TTor X	3.50 in.	same	same	<1 gm
		3.00 in.	3.55 in.	TTor X	4.50 in.	same	same	<1 gm
		4.00 in.	4.55 in.	X	5.50 in.	same	same	<1 gm
		5.00 in.	5.55 in.	X	6.50 in.	same	same	<1 gm
		6.00 in.	6.55 in.	X	7.50 in.	same	same	<1 gm
S325P	32.5mm (1.281")	.50 in.	1.45 in.	TTor X	2.95 in.	100 psi 7.0 Kg/cm²	.04 cu in/sec/psi	<4 gms
		1.00 in.	1.95 in.	TTor X	3.45 in.	same	same	<4 gms
		2.00 in.	2.95 in.	TTor X	4.45 in.	same	same	<4 gms
		3.00 in.	3.95 in.	TTor X	5.45 in.	same	same	<4 gms
		4.00 in.	4.95 in.	X	6.45 in.	same	same	<4 gms
		5.00 in.	5.95 in.	X	7.45 in.	same	same	<4 gms
		6.00 in.	6.95 in.	X	8.45 in.	same	same	<4 gms
S444P	44.4mm (1.75")	.50 in.	1.45 in.	TTor X	2.95 in.	75 psi 5.3 Kg/cm²	.15 cu in/sec/psi	<8 gms
		1.00 in.	1.95 in.	TTor X	3.45 in.	same	same	<8 gms
		2.00 in.	2.95 in.	TTor X	4.45 in.	same	same	<8 gms
		3.00 in.	3.95 in.	TTor X	5.45 in.	same	same	<8 gms
		4.00 in.	4.95 in.	X	6.45 in.	same	same	<8 gms

How to Order Stock Actuators

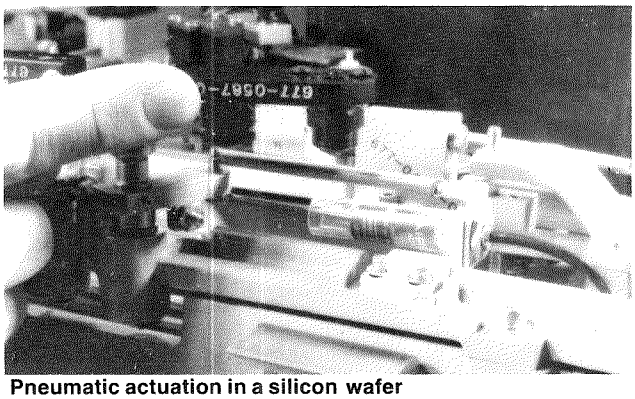
To order stock actuators, develop the appropriate actuator part number utilizing the data in the table above. Use the following example for reference, or contact the Airpot technical staff for assistance.



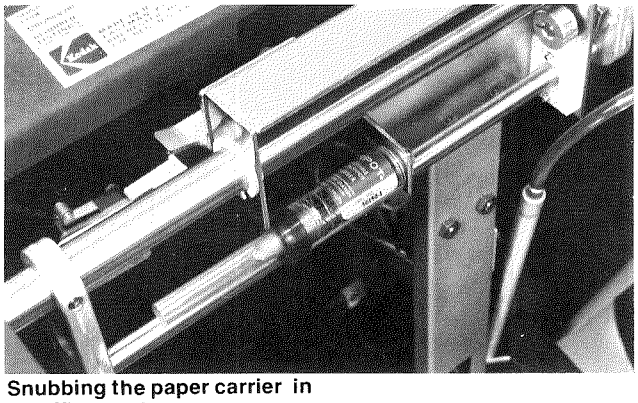
Airpot® Installations



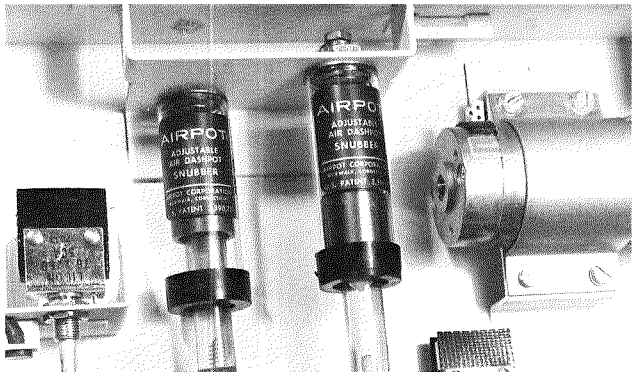
Damping solenoid actuated read/write heads in a floppy disk drive.



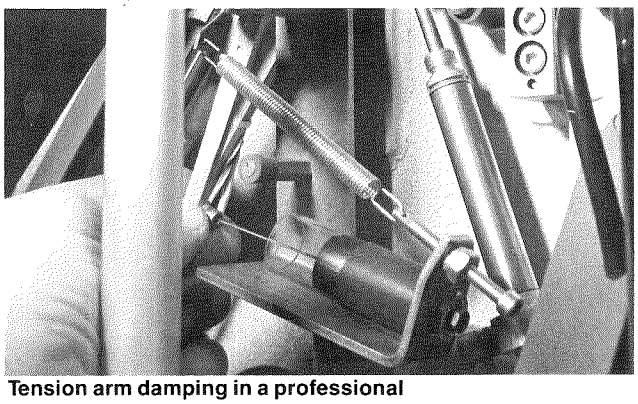
Pneumatic actuation in a silicon wafer photomask aligner.



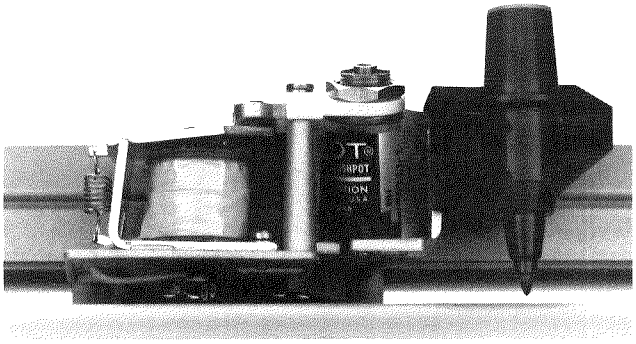
Snubbing the paper carrier in an office copier.



Snubbing a shutter plate in a medical X-ray machine.



Tension arm damping in a professional videotape player.



Damping an X-Y plotter pen.

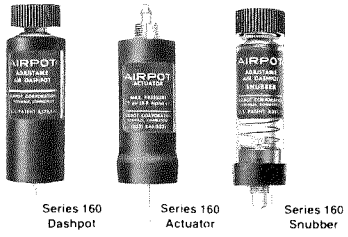
About Airpot®...

The dashpot concept has existed for many years. Most dashpots have been relatively crude devices with a variety of associated problems such as leak, excess friction, temperature instability, and early wear. Until the development of the Airpot dashpot, relatively little effort was directed at refining pneumatic dampers and few, if any, industries considered it worth developing as a product for OEM equipment. As a result, pneumatic dashpots typically have been used as a last resort or for a non-critical problem.

The Airpot dashpot is a striking exception to the history of pneumatic dampers. About 40 years ago, our founder designed an electromechanical regulator which required a precision pneumatic dashpot as a major component. Since no such dashpots were available, one was developed for use in the product. As the regulator became a success, some of its customers noticed, and had use for, the unique dashpot within it. After a period of years the dashpot, trade named Airpot, became a separate product line. Airpot actuators were then developed because many customers expressed a desire for an actuator with the same unique features as the dashpot.

Since the Corporation was formed, Airpot motion control devices have gained widespread popularity and respect. Having been refined throughout its 40 years in a wide variety of applications, the Airpot design sets the state-of-the-art in pneumatic dashpots.

May we provide a sample?



Series 160 Dashpot | Series 160 Actuator | Series 160 Snubber

For a unit built to your specifications, please call us so that we may help you determine the proper model and options for your particular application. We even have special testing equipment that can usually simulate the dynamic response of your system. Use these numbers for any questions you may have:

(203) 846-2021 Telex 643-688

For a standard sample Airpot dashpot or actuator, complete this reply card.

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27 Lois Street
Norwalk, CT 06851

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Airpot®

AIRPOT CORPORATION
27 Lois Street, Norwalk, CT 06851
(203) 846-2021 Telex 643-688

Bulletin P3-81

Printed in U.S.A.

AIR DASHPOT *SERIES 56*

This Airpot® model uses the same technology and high quality materials as our larger sizes. It is designed for providing responsive damping for light load or sensitive applications. It is ideal for high cycle life or low speed, clean operation.

It provides vibration damping, controls velocity of spring-loaded mechanisms, reduces impact and can be used as a mechanical time delay. Typical applications are in sensitive measuring instruments, semiconductor handling equipment, delicate tensioning mechanisms, and computer disk drives.

SPECIFICATIONS:

Mounting hole: rectangular
.312 in x .375 in *(7.92 x 9.525 mm)*
Round
.375 in (9.525 mm)
Panel thickness
.125 in *(3.17 mm)* maximum

[A]
5/64 Hex socket head adjusting screw

[B]
3/8-32 Mounting nut and lock washer provided; recommended tightening torque 2-4 in lbs

[C]
Wrist pin swivel angle ±25° min x ±1° in other plane

[D]
.32 in *(7.6 mm)* maximum diameter

[E]
.39 in *(10 mm)* maximum diameter with optional case

BORE
.220 in *(5.59 mm)*

DAMPING COEFFICIENT
Regular damping .5 lb/inch/sec
Super damping 2 lb/inch/sec

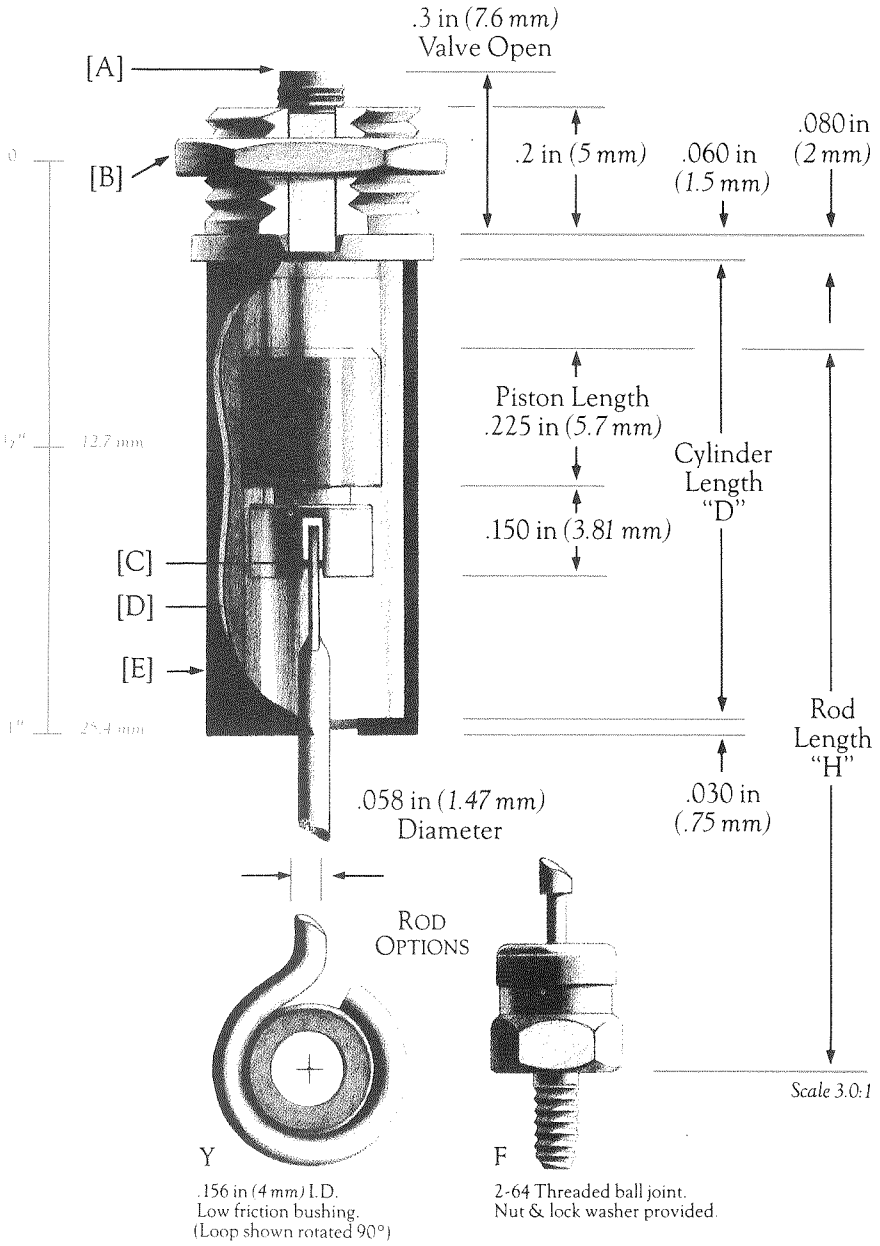
MAXIMUM PULL FORCE
.5 lb *(.22 kg)*

MAXIMUM FRICTION FORCE
Less than 1 g

OPERATING TEMPERATURE RANGE
−75°C to +150°C

APPROXIMATE PISTON WEIGHT
1.5 g

CYLINDER WEIGHT
1st inch: 6 g;
each additional inch: 1.2 g



Airpot®
The intelligent solution to motion control problems.

AIR DASHPOT *SERIES 56*

PRODUCT FEATURES:

- Fully adjustable over 10,000:1 range.
- Ultra low friction—responds to less than 1 gram of input force. Virtually no hysteresis.
- Insensitive to temperature fluctuations over a wide temperature range.
- Uses no seals.
- Requires no lubrication or maintenance.
- Runs clean and will not contaminate surroundings.
- Low mass and compact size.
- Virtually wear-free.
- Can sit idle for extended periods and respond instantly, like new, when needed.
- Free floating piston allows easy installation and misalignment of load up to 25° (in one plane).
- Custom stroke lengths to OEM user specifications.
- Can be cycled at any speed.
- Does not deteriorate with age.

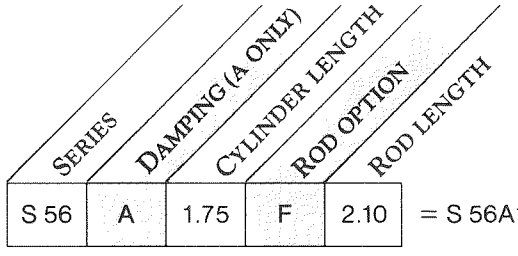
The chart below specifies those sizes available from stock for order quantities under 25 units. Custom strokes and rod configurations are available with larger orders.

SERIES DESIGNATION	DAMPING DIRECTION: 2 WAY	CYLINDER LENGTH "D"	ROD OPTION	ROD LENGTH "H"
S 56	A	0.40"	F or Y	1.125"
		0.75"	F or Y	1.125"
		1.00"	F or Y	1.350"
		1.25"	F or Y	1.600"
		1.75"	F or Y	2.100"

For other models, options and configurations, please refer to our catalogue.

To determine the part number for the dashpot of your choice, please use this example as a guide.

Example:



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Airpot®

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Printed in USA P3-102

PNEUMATIC ACTUATOR *SERIES 56*

This Airpot® model uses the same technology and high quality materials as our larger sizes. It is designed for providing air controlled motion for delicate loads, high cycle life requirements, high speed, clean operation, long term reliability, as well as smooth and gentle motion.

Typical applications include use in precision instrumentation, medical equipment, semiconductor processing equipment, and other machinery with stringent operating requirements.

SPECIFICATIONS:

Mounting hole
.2 in (*5 mm*)
Panel thickness
.06 in (*1.5 mm*) maximum

[A]
M2.5-0.45 Threaded hose fitting

[B]
M5-.8 Mounting nut and lock washer provided; recommended tightening torque 2-4 in lbs

[C]
Wrist pin swivel angle ±25° min
x ±1° in other plane

BORE
.22 in (*5.59 mm*)

MAXIMUM PRESSURE
150 psi (*10 kg/cm²*)

PISTON AREA
.038 sq in (*.245 cm²*)

MAXIMUM VACUUM ACTUATED PULL FORCE
.5 lb (*.2 kg*)

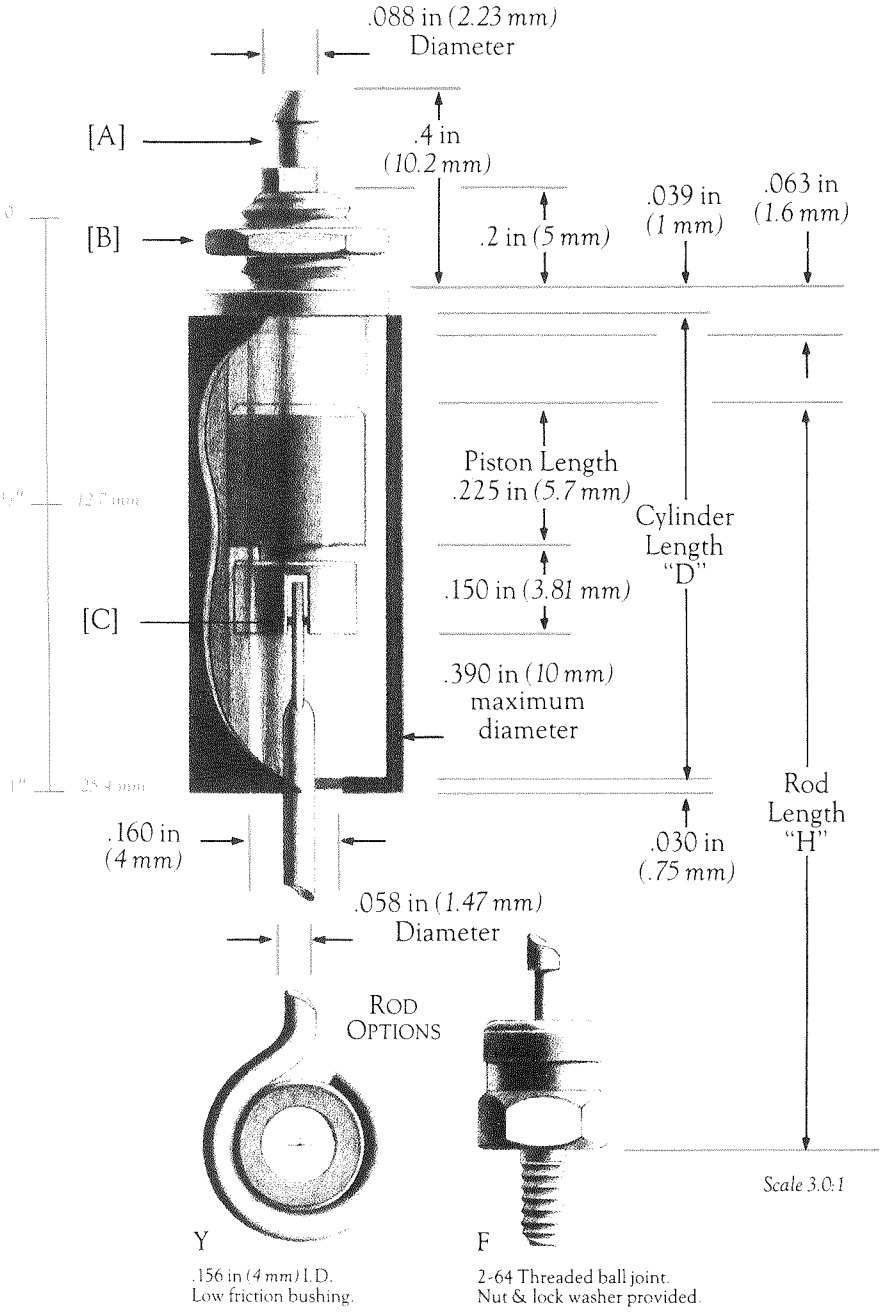
MAXIMUM FRICTION FORCE
Less than 1 g

OPERATING TEMPERATURE RANGE
−75°C to +150°C

AIR LOSS
Regular .003 cu in/sec/psi
Super .00075 cu in/sec/psi

APPROXIMATE PISTON WEIGHT
1.5 g

CYLINDER WEIGHT
1st inch: 6 g;
each additional in: 1.2 g



Airpot®
The intelligent solution to motion control problems.

PNEUMATIC ACTUATOR *SERIES 56*

PRODUCT FEATURES:

- Ultra-low friction graphite piston in a tempered glass cylinder selectively matched for perfect fit.
- Stable over wide temperature range.
- Responds to less than .01 psi pressure.
- Equally sensitive to vacuum.
- Speed can be controlled simply by adjusting air pressure.
- Oil-free; never requires lubrication or any other maintenance.
- Runs clean and will not contaminate surroundings.
- No seals to wear or abrade.
- Virtually wear-free for hundreds of millions of cycles—or more.
- Can be cycled at any speed.
- Will not rust or corrode.
- Can sit idle for extended periods and respond instantly, like new, when needed.
- Compact for tight spaces.
- Easily accepts a variety of hose fittings.
- Free floating piston allows easy installation and misalignment of load up to 25° (one plane only).

Custom stroke lengths to OEM user specifications.

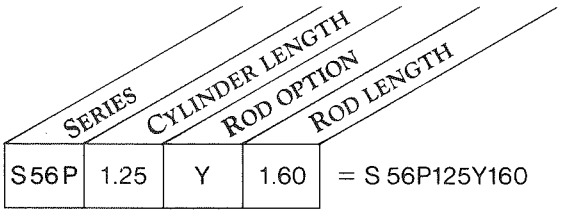
The chart below specifies those sizes available from stock for order quantities under 25 units. Custom strokes and rod configurations are available with larger orders.

SERIES DESIGNATION	STROKE	CYLINDER LENGTH "D"	ROD OPTION	ROD LENGTH "H"
S 56 P	0.125"	0.40"	F or Y	1.125"
	0.475"	0.75"	F or Y	1.125"
	0.725"	1.00"	F or Y	1.350"
	0.975"	1.25"	F or Y	1.600"
	1.475"	1.75"	F or Y	2.100"

For other models, options and configurations please refer to our complete catalogue.

To determine the part number for the actuator of your choice, please use this example as a guide.

Example:



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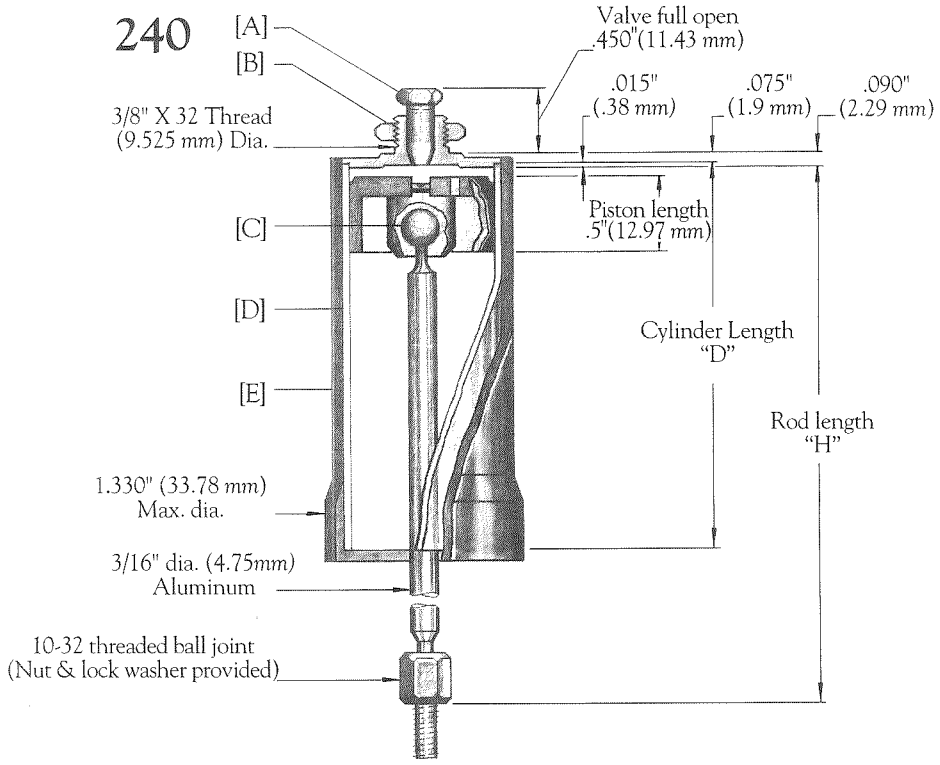
Printed in USA P3-103

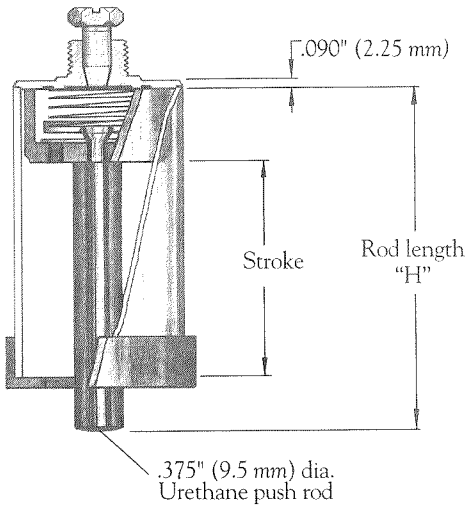
AIR DASHPOT SERIES 240

This Airpot Model uses the same technology and high quality materials as our other sizes. It is designed to deliver moderate damping levels while still maintaining the low friction characteristics and long life of our smaller models. It provides vibration damping, controls the velocity of spring loaded mechanisms, reduces impact and shock, and can be used as a mechanical time delay. Typical applications are in office copiers, mailing and packaging equipment, semiconductor processing equipment, and medical analyzers. This model can also be equipped with a hose fitting for use as a low friction actuator.

240



240S (Snubber)



SPECIFICATIONS:

Mounting hole: rectangular
.312 in x .375 in (7.92 x 9.525 mm)

Round
.375 in (9.525 mm)

Panel thickness
.125 in (3.17 mm) maximum

[A] 1/4 in Hex, slotted head adjusting screw

[B] 3/8-32 Mounting nut and lock washer provided; recommended tightening torque 4-8 in lbs.

[C] 1/4 in ball swivel

[D] 1.088 in (27.635 mm) Maximum diameter (cyl.)

[E] 1.230 in (31.24 mm) Max. dia. with optional case

BORE
.945 in (24.0 mm)

DAMPING COEFFICIENT
Regular damping: 15 lb/inch/sec
Super damping: 30 lb/inch/sec

MAXIMUM PULL FORCE
9 lb (4 kg)

MAXIMUM FRICTION FORCE
Less than 2 gm

OPERATING TEMP. RANGE
-75°C to +150°C

APPROX. PISTON WEIGHT
7 gm

CYLINDER WEIGHT
1st inch: 16 gm
each additional inch: 7 gm

SPECIFICATIONS:

(See dashpot series 240 for external dimensions.)

DAMPING: 0–.75 ft/lbs
(Push direction only)

STROKE:
Stock Units:
1.378" (35 mm)

OEM Units:
1.378" (35 mm)

Other strokes available on request.

EXTENDED LENGTH
3.30" (83.82 mm)

SPRING FORCE
Extended:
.13# (59 gm) Max.
Compressed:
.27# (122 gm) Max.

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The intelligent solution to motion control problems.

AIR DASHPOT SERIES 240

PRODUCT FEATURES:

- Fully adjustable over 10,000 : 1 range.
- Ultra low friction – responds to less than 2 grams of input force. Virtually no hysteresis.
- Insensitive to temperature fluctuations over a wide temperature range.
- Uses no seals.
- Requires no lubrication or maintenance.
- Runs clean and will not contaminate surroundings.
- Low mass and compact size.
- Virtually wear-free.
- Can sit idle for extended periods and respond instantly, like new, when needed.
- Free floating piston allows easy installation and misalignment of load up to ±15°(With rod type X.)
- Custom stroke lengths to OEM user specifications.
- Can be cycled at any speed.
- Does not deteriorate with age.

The chart below specifies those sizes available from stock for order quantities under 25 units. Custom strokes and rod configurations are available with larger orders.

	DAMPING DIRECTION			CYLINDER LENGTH "D"	RODS AVAILABLE	ROD LENGTH "H"	DAMPING RANGE
S240	A: 2-WAY	B: PULL	C: PUSH				
	✓	✓	✓	.75"	X	1.75"	0–30 lbs/in/sec
	✓	✓	✓	1.00"	X	2.00"	0–30 lbs/in/sec
	✓	✓	✓	1.50"	X	2.50"	0–30 lbs/in/sec
	✓	✓	✓	2.00"	X	3.00"	0–30 lbs/in/sec
	✓	✓	✓	3.00"	X	4.00"	0–30 lbs/in/sec
S240S	N.A.	N.A.	✓	1.893"	.375" Dia. Urethane	1.80"	0–.75 ft–lbs

For other models, options and configurations, please refer to our catalogue.

To determine the part number for the dashpot of your choice, please use this example as a guide.

Example:

SERIES	DAMPING	CYLINDER LENGTH	ROD OPTION	ROD LENGTH	
S240	A	.75	X	1.75	= S240A.75X1.75

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